MASSACHUSETTS INSTITUTE OF TECHNOLOGY
DEPARTMENT OF MECHANICAL ENGINEERING
CAMBRIDGE, MASSACHUSETTS 02139

September 15, 1981

DeWitt Stetten, Jr., M. D., Ph.D.
National Institutes of Health
Bethesda, Maryland 20205

Dear Doctor Stetten:

A pediatrician friend brought to my attention your "Sounding Board" comments on "Coping with Blindness" in the New England Journal of Medicine for August 20, 1981. Your remarks invoked both nostalgia and a sense of shared frustration with respect to the problem you address.

Let me start by noting that as a M.I.T. faculty member in an engineering department, my interdisciplinary research over the past two decades has focussed on understanding and ameliorating chronic disabling conditions through the application of technology. I enclose copies of the Annual Report of our Biomechanics and Human Rehabilitation Laboratory and of our program bibliography.

My interest in blindness was precipitated in the late 1950's by a very gifted person who had been maimed and blinded on the battlefield and then deprived medical attention in captivity during the Second World War. John Kenneth Dupress challenged me to redirect my research efforts from missiles to rehabilitation. When I in turn challenged John as to why I should select blindness over other fascinating interfaces between engineering and medicine, Mr. Dupress offered an aphorism which has since lodged in my memory, "An ophthalmogist is to a blind man as a general practitioner is to a corpse." John's phrasing could well serve as a cryptic presis for your Journal comments!

What absolutely flabbergasts and frustrates me is that I must also share in the culpability of the failure to communicate to you, and therefore clearly to other individuals of failing eyesight, some of the efforts that have been made to ameliorate the condition. We have tried, but clearly the message hasn't gotten through. I enclose, for example, a chapter I prepared in 1974 on Prostheses for Sensory Rehabilitation, and a more recent article from the M.I.T. Technology Review. As this latter article suggests, persons with disabling conditions are becoming more vocal and visible, largely through their own efforts, which should enhance bilateral communication between the needs of the disabled and the responses of those of us in technology and medicine who try to improve their condition.

With respect to your interest in a "sonar device to assist blind persons in their ambulatory navigation," let me bring especially to your attention information in both articles on the Pathsounder, the

EX
LIBRIS
M.C. MIGEL LIBRARY
AMERICAN PRINTING
HOUSE FOR THE BLIND

Laser Cane and the Sonic Guide. All three of these mobility devices are now commercially available. I am personally involved in an effort to capitalize on the high production economy of the Sonar ranging system developed by Polaroid in the hope that this may contribute to the future development of a less expensive and more versatile mobility device.

If any of the material I am conveying raises questions, or if I can be helpful in any other way, I would be happy to communicate further.

Sincerely yours,

Robert W. Mann
Whitaker Professor
of Biomedical Engineering

RWM:lab
Enclosures

November 1, 1991

Professor Robert W. Mann
Mass. Institute of Technology
77 Mass. Ave.
Room 3-144
Cambridge, MA 02139

Dear Dr. Mann:

Thank you so much for sending along the correspondence which you have had with Dr. DeWitt Stetten.

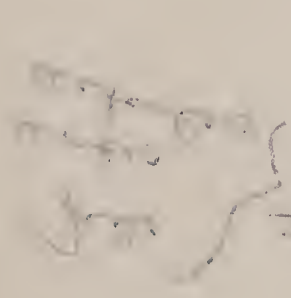
Your description of the devices and of their uses, as well as functional limits, was most enlightening. I have made copies for interested persons here.

Please keep in touch.

Sincerely,

Rachel Ethier Rosenbaum
Executive Director

RER/lvd



MASSACHUSETTS INSTITUTE OF TECHNOLOGY
DEPARTMENT OF MECHANICAL ENGINEERING
CAMBRIDGE, MASSACHUSETTS 02139

October 9, 1981

RECEIVED
OCT 13 1981

Mr. DeWitt Stetten, Jr., M.D., Ph.D.
Senior Scientific Advisor, N.I.H.
Building 16, Room 118
Bethesda, MD 20205

Dear Doctor Stetten:

With respect to mobility aids for the blind, the Pathsounder, the Sonicguide and the Nurion Cane are all commercially available. None can begin to do for a blind traveller what the Seeing Eye Dog can. The dog certainly provides a richer and wider-ranging source of environmental cues. But it also imposes on its master and the master's environment a special set of requirements, a physically vigorous and commanding individual to control the dog and acceptance of its physiological requirements and social inconvenience.

The three available mobility devices differ in the energy source they use for acquiring environmental information, the manner in which they are manipulated by the human motor system and the technique for display to the human of environmental information through a surrogate sense.

The Pathsounder and Sonicguide employ ultrasound while the Nurion Cane uses laser optics. The Pathsounder is carried on the chest supported by a neck strap, like a camera; the Sonicguide is incorporated into a pair of spectacles; the Nurion Cane integrates the acquisition and display system into a somewhat heavier long cane. A cane is indispensable, so the Pathsounder and Sonicguide supplement a long cane.

The display on the Pathsounder is the simplest. If no echoes are received from the ultrasound flooding the path of the traveller a step or so beyond the cane's reach, the Pathsounder is silent. If any reflection is received, the Pathsounder either generates an audible cue and/or a vibratory cue. With body English, the traveller can identify the location of the obstacle and devise a trajectory to avoid it.

The Sonicguide is directed by head movement and presents an auditory display to both ears binaurally. Differential volume to each ear provides azimuthal location of the reflecting object. Range to the reflecting object is coded into audio frequency. Furthermore, the presence of overtones on the primary range frequency suggests the dispersive nature of the reflecting surface; thus trees with their many leaves provide a complex overtone; a picket fence a more regular overtone; a plate-glass window a pure tone.

The tradeoffs between the Pathsounder and Sonicguide are simplicity of display with ease of learning versus a richer but more complex display which requires considerable learning.

The Nurion Cane has several light-triangulation systems built into the cane structure which activate a poke probe in the handle to indicate an obstacle in front of the traveller; a high-pitched audio tone to indicate something at head height; and a low-pitched tone to indicate a drop-off.

I personally have much less experience with the Nurion Cane than with the Sonicguide and Pathsounder. Further information on the Pathsounder is available from Mr. Lindsay Russell, area code (617) 547-0819, and on the Sonicguide (manufactured in New Zealand) from the U. S. distributor, Sensory Aids Corporation area code (312) 766-3935.

I believe the best way to become familiar with the comparative advantages and disadvantages of these several devices would be at a rehabilitation facility for the severely visually impaired and blind. In Boston, for example, this would be the Carroll Center; there must be a comparable facility in the Washington area.

I hope this is of some help.

Sincerely yours,

Robert W. Mann
Whitaker Professor
of Biomedical Engineering

RWM:lab

DEPARTMENT OF HEALTH & HUMAN SERVICES

Public Health Service

National Institutes of Health
Bethesda, Maryland 20205

September 24, 1981

Mr. Robert Mann
Professor of Biomedical Engineering
Massachusetts Institute of Technology
Dept. of Mechanical Engineering
Cambridge, MA 02139

Dear Professor Mann:

Thank you very much for your letter and for the enclosed descriptive materials of mobility aids for the blind. I have discussed this problem with your former colleague and my friend, Dr. Murray Eden, who now is in charge of the instrument development area in our Division of Research Services. I had sent him some earlier information received from Polaroid and I am aware that they have manufactured a prototype cane to assist blind people. At least at that time the cane they were interested in was not commercially available. I have since made contact with a group in King of Prussia, PA (Nurion, Inc. - 215/265-8947) and I believe they will be showing me a demonstrator model of this device. How these compare in usefulness to a seeing eye dog, I do not know. Do you by chance have any feedback on this comparison.

The normal channel of communication to the visually handicapped patient is through his ophthalmologist and it is, I believe, at this level that communication is obstructed. Either the ophthalmologists are unaware of the kind of work you are doing, or they elect not to transmit it to their patients. Certainly no ophthalmologist who I have consulted has ever mentioned such devices to me. I have heard about them through devious channels.

I am forwarding your materials to Murray Eden for his perusal.

Sincerely yours,

DeWitt Stetten, Jr.

DeWitt Stetten, Jr., M.D., Ph.D.
Senior Scientific Advisor, NIH
Building 16, Room 118
Bethesda, MD 20205